Nanoparticles Image Breast Cancer

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Current methods of detecting breast cancer suffer from low sensitivity, limited spatial resolution, or the need to use complicated and expensive radioisotope-based technologies. A new report from investigators at the Emory-Georgia Tech Nanotechnology Center for Personalized and Predictive Oncology suggests that targeted iron oxide nanoparticles may overcome these limitations and could serve as novel imaging agents for the early detection of breast tumors.

Reporting its work in the journal *Clinical Cancer Research*, a research team led by Lily Yang, M.D., Ph.D., and Hui Mao, Ph.D., both of the Emory University School of Medicine, describes its development of a new type of nanoparticle construct comprising a single iron oxide crystal coated with a polymer. This polymer both stabilizes the magnetic core and provides attachment points for tumor-targeting peptides and fluorescent dyes. The targeting peptide is a fragment of a molecule known as urokinase-type plasminogen activator; this fragment binds to a receptor that is overexpressed by breast cancer cells.

In an initial set of experiments, the investigators showed that this construct was taken up specifically by breast tumor cells growing in culture, with virtually no uptake by other types of cells. The researchers were able to image the nanoparticles by detecting the fluorescent dye using standard fluorescence microscopy.

Next, the researchers injected the nanoparticles into mice bearing human breast tumors. By 5 hours after the injection, the nanoparticles were readily detected in tumors using a commercial magnetic resonance

imaging scanner. In contrast to untargeted nanoparticles, there was far less uptake of the imaging agent by liver and spleen. The tumor-targeting properties of these nanoparticles were confirmed using fluorescence imaging, which is possible in an animal as small as a mouse.

This work, which is detailed in the paper "Receptor-targeted nanoparticles for in vivo imaging of breast cancer," was supported by the NCI Alliance for Nanotechnology in Cancer, a comprehensive initiative designed to accelerate the application of nanotechnology to the prevention, diagnosis, and treatment of cancer. Investigators from Georgia State University and Ocean Nanotech, LLC, also participated in this study. An abstract is available at the journal's Web site.

Source: National Cancer Institute (news : web)